Battlefield Medicine

Session 1
January 31st, 2023

OLLI Spring 2023 Semester

Ancient History

Definitions
Treatment of war Injuries
Rome, Greece
Weapons

Néstor A. Ramírez, MD, MPH

Plan for the Course

- Session 1: Ancient history, Rome, Greece.
- Session 2: Middle Ages, weapons & injuries.
- Session 3: US Revolutionary & Civil Wars.
- Session 4: World War I.
- Session 5: World War II.
- Session 6: Korea, Vietnam.
- Session 7: 20th & 21st Century Regional wars.
- Session 8: Peek into future, Nuclear War?

Plan for Session 1

- War and Medicine
- Primitive Warfare
- War injuries in The Illiad
- Greek War Medicine
- Roman War Medicine
- Opium
- Types of wounds
- Weapons
- Chariot Warfare

WAR AND MEDICINE

War

- "War is about many things, but at its core it is about killing or getting killed."[1]
- "Wars are the sum of battles, battles are the tally of individual human beings killing and dying."[2]
- "Some of you young men think that war is all glamour and glory, but let me tell you, boys, it is all hell! War is cruelty. There's no use trying to reform it, the crueler it is the sooner it will be over."[3]

1.M Stephenson, 2012
2. VD Hanson, 2001
3. WT Sherman, 1864

War and Medicine

- "Studying the few remaining hunter-gatherer societies drives one to the unsettling conclusion that there has never been a time when humans did not devote a large portion of their energies to injuring one another.

- It is also evident that, for almost as long as some have specialized in carnage, others have struggled to fix its damage."[1]

1. JE McCallum, 2008

War and Medicine

"Were it not so tragic, there would be something comical in the way man invents machines to kill and injure, then uses his ingenuity to provide methods of repairing damages caused by his own destructive genius."

Mabel Boardman, Red Cross historian, 1915.

Warriors

"What brings a warrior to his death is a convergence of many factors:

- The weapon that kills him.
- The tactics that brought him to the place and manner of his death.
- The boundaries of the killing field.
- The decisions he makes or the decisions that others make on his behalf.
- The ability of medical services to save his life."[1]

1. M Stephenson, 2012

Illness & Injury

- Primitive cultures considered injury and illness as one, differing only in the cause:
  - Injury was caused by an identifiable act
  - Illness was inflicted by an enemy's curse or by the maleficence of a god

- When people strayed from their areas to make war, they took their infections with them and inflicted them on populations who might have no immunity.

Primitive Warfare

- The development of the throwing-spear and ambush hunting techniques required cooperation, which made potential violence between hunting parties very costly.
- A natural consequence of conflict avoidance was the migration of *Homo erectus* from Africa about 1.8 million years ago.
- This was accelerated by maintaining low population densities as a way to prevent competition for resources.

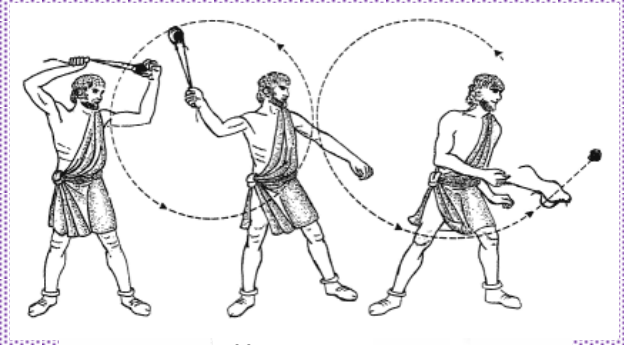
Primitive Warfare

- Paleolithic warlessness persisted until well after the appearance of *Homo sapiens* some 315K years ago.

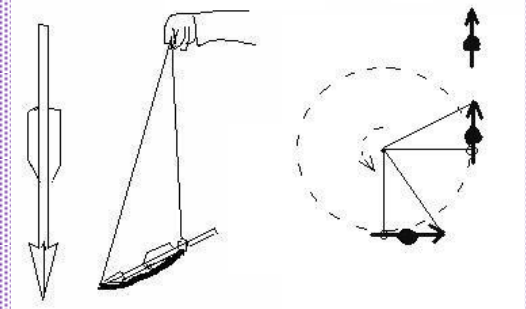
- This ended only when economic and social shifts associated with sedentism incentivized organized raiding of settlements.

- In Nataruk , Kenya, numerous 10K year-old human remains had evidence of major traumatic lethal injuries with obsidian **bladelets** embedded in the skeletons.

Primitive Warfare



Kestron



- The development of maces, slings, and kestrons influenced early warfare.
- The bow was the most important weapon in early warfare, because it enabled attacks to be launched with far less risk to the attacker.
- The development of the bow is concurrent with the first known depictions of organized warfare illustrated by groups of men attacking each other.

Primitive Warfare

Cave paintings show men armed with bows, spears or clubs:

- Bows were used for distant warfare.
- Spears were used for medium distance engagement.
- Clubs were used for close face-to-face combat.

GREEK WAR MEDICINE

War Injuries in The Illiad

- In 1879, H. Frölich, a German surgeon, studied the 147 warrior wounds described in The Illiad.
- His description has been re-analyzed by computer and by scholars of the Classics.
- Homer's descriptions and counts are merely a poetic approximation, but give a fair idea of war and injuries in the Greek era.

Frölich's Table

		Stone	Sword	Spear	Arrow	Total
Head	F	4	8	17	2	31
	NF	0	0	0	0	0
	?	0	0	0	0	0
Neck	F	1	4	8	0	13
	NF	0	0	1	0	1
	?	1	0	0	1	2
Trunk	F	1	4	59	3	67
	NF	1	0	5	3	9
	?	0	0	3	0	3
Arm	F	1	1	0	0	2
	NF	0	0	6	1	7
	?	0	0	1	0	1
Leg	F	1	0	0	0	1
	NF	2	0	3	2	7
	?	0	0	3	0	3
Totals		12	17	106	12	147

F = fatal, N = non-fatal, ? = uncertain.

H Frölich, 1879

War Injuries in The Illiad

- 114 of the 147 injuries were fatal (77.5%):
  - Head: 31 (21.1%)
  - Trunk: 67 (45.6%)
  - Neck: 13 (8.8%)
  - Arm: 2 (1.4%)
  - Leg: 1 (2.8%)
- Spears were the most frequent: 84/147 (57%).
- Swords were: 17/147 (11.6%).
- Arrows were: 12/147 (8.2%).

War Injuries in The Illiad

- All sword injuries were fatal.
- Most vulnerable areas were:
  - Trunk (chest and abdomen)
  - Head (brain, face)
  - Neck (vital blood vessels and airway)
  - Arm (ability to attack)
- Very little organized medical care was delivered to the wounded soldiers in either the Greek or Trojan sides.

Healing in the Illiad

- Telephus was wounded by Achilles when the Achaeans came to his kingdom on their way to sack Troy and bring Helen back to Sparta.
- The Mysians were victorious, and the Greeks returned home, but Telephus' wound would not heal.
- The oracle of Apollo: told Telephus: "Your assailant will heal you".
- So Telephus went to Argos and there was healed by Achilles.
- The story is that rust scraped from Achilles' spear was the healing agent, and JA Paris' *Pharmacologia* identifies it as verdigris, which has medicinal properties.

MH Cuesta, 2013

Machaon Extracts Menelaus' Arrow

- Machaon and Podalirius, sons of Asklepios, were physicians for the Greek forces in battle.
- They joined the Greek army as physicians and commanders but participated in combat.
- Machaon was mentioned as a surgeon, and Podalirius became the patron of internal medicine, diagnostics, and psychiatry.

Greek War Medicine

- To Hippocrates, surgery and war were integrally linked.
- Hippocrates advised those who wanted to be a surgeon to find an army and follow it.
- To be effective, medical services should be delivered to the wounded soldier in a timely fashion at the battle field.

Greek War Medicine

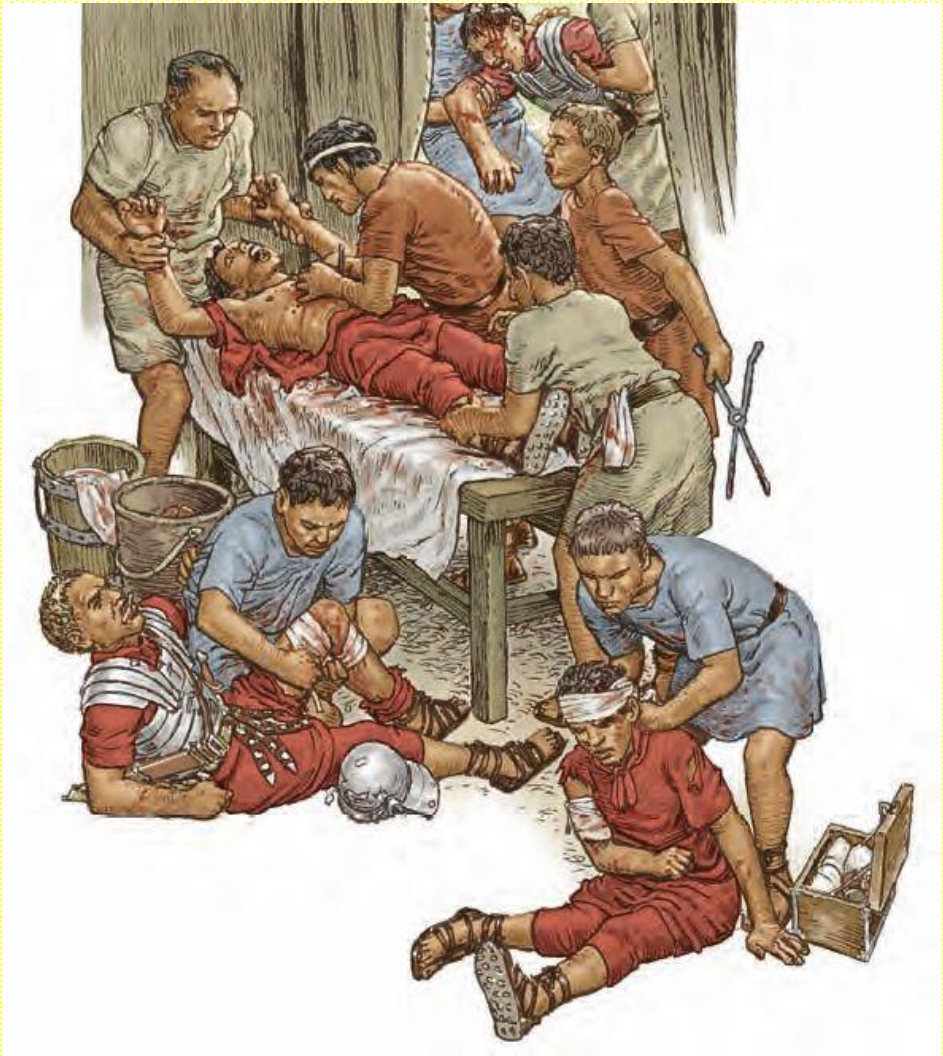
- *Iatros*, the Greek word for physician, literally means “remover of arrows”.
- Their surgery was limited to repair of wounds.
- Greek military leaders also performed as wound surgeons, and the few surgeons accompanying the troops doubled as military leaders.

Greek War Medicine

- Fellow soldiers were primarily responsible for care of the wounded, and since armies were mostly tribal, warriors were obligated by familial bonds.
- Only the most rudimentary care was available:
  - Washing
  - Binding/bandaging
  - “Anesthesia” with wine
  - Natural soporifics and analgesics
- The final outcome was in the hands of the gods.

Greek War Medicine

- Greek war surgery succeeded only in the treatment of minor wounds, because the lack of anatomical knowledge precluded sophisticated surgical procedures.
- Wound treatment was performed without magic rites or conjurations, suggesting that ancient Greeks performed war surgery as a medical science without magic or religion.
- Bleeding was stopped with herbs that also are described to have analgesic effects, but unfortunately, these plants are not identified and still remain unknown.



ROMAN WAR MEDICINE

Roman War Medicine

- For several hundred years after the founding of the Republic, Roman Medicine, especially military medicine was at a very low standard.
- Medical care was provided by Greek slaves, who were distrusted by the Romans.
- By the Punic wars, generals and emperors realized that a soldier who knew his wounds would be looked after would fight better.

Roman Military Medicine

- Military medicine became a state obligation.
- Military surgeons were given rank of non-commissioned officers, were excused from battle and camp duties, and were assigned to every Roman legion and vessel.
- Germanicus paid them from his own pocket, and Julius Caesar gave them citizenship.

Roman Military Medicine

- As the empire expanded, the wounded were cared for in a network of military hospitals (*valetudinaria*).
- These were very sophisticated and gave attention to hygiene and sanitation.
- The progress in Roman military medicine was more organizational than medical: they still followed the antiquated Classic Greek works.

Roman Military Medicine

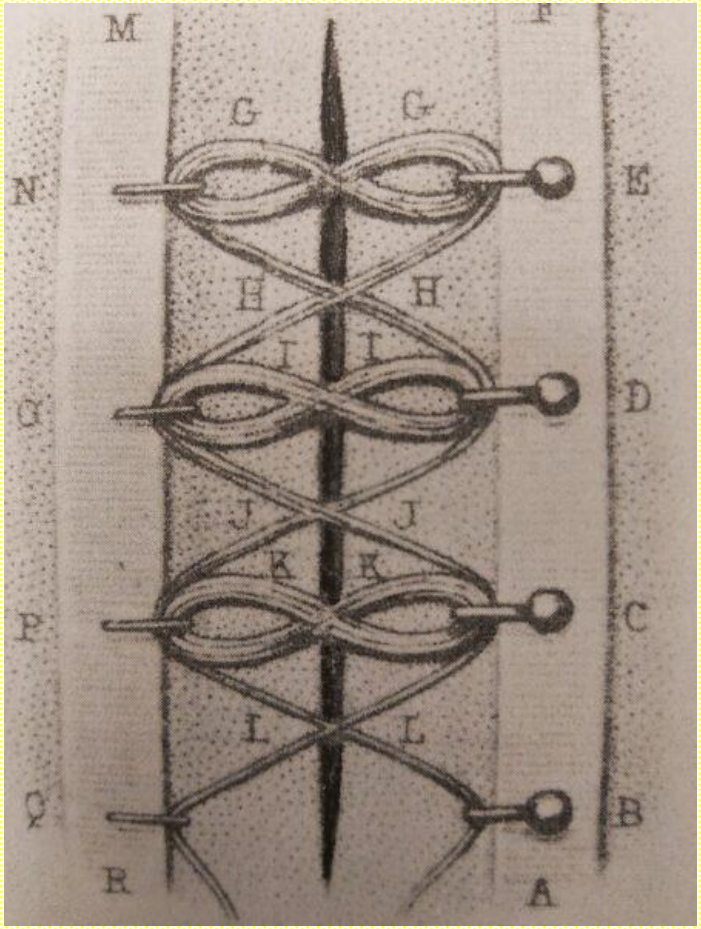
- Wounds were stitched following using flax, linen thread or metal pins.
- Dressings were of linen bandages or sponges and either dry or wet, soaked in wine, oil, vinegar or water and kept moist with a cover of fresh leaves.
- Doctors recognized that there was not much they could do with injuries to the brain, heart, liver, intestines, spine, kidneys, and arteries.

Roman Military Medicine

- The men were largely self-reliant, and in case of need all were ready to aid one another.
- This was the first and only means of relief and would persist long after a regular system had been evolved.
- Among any primitive, warlike people, the fighters must be able to care for their own wounds, so the rank and file soon acquired knowledge of the rudiments of surgery.
- Roman soldiers were equipped with bandages for use in emergencies; if unwilling to engage in battle, to feign disability they used their bandages on uninjured limbs.

Roman Military Medicine

Medical surgical kit



Fibulae for skin closure

Wound Management

- Since antiquity, the basic principles have remained unchanged:
  - Stop bleeding
  - Prevent infection
  - Help wound to heal
- Wounds washed usually with wine or vinegar, or therapeutic herbs, compound of milk, and essence of fig were used as treatment alternatives
- Historically, much debate about dressing wounds and the role of pus.

Pus, Laudable or Not

- Pus is the most easily seen and recognizable signs of an infection.
- For many centuries, suppuration, known as '*laudable pus*,' (*pus bonum et laudabile*) was believed to be a sign of a healthy, healing wound.
- Misconception based on the presentation of soft tissue infections:
  - Chronic wound infections, due to *pyogenic* bacteria, typically produce large amounts of thick, whitish-yellow pus.
  - Necrotizing soft tissue infections, despite their severe morbidity and mortality, do not produce pus in the traditional sense.

Ancient War Medicine

- Any kind of serious wound would almost inevitably cause the soldier's death.
- The only differences between the doomed and the saved were:
  - The kindness of comrades
  - The limited effectiveness of herbal medicines
  - The fervent appeal to the gods
- This was a fragile boundary, and most were doomed.

Questions ? (1)

TYPES of WOUNDS

Types of Wounds

Wounds may be classified as:

- Closed, in which the skin has not been compromised, but trauma to underlying internal structures has occurred.
- Open, in which the skin has been compromised and underlying tissues are exposed.

Types of Injuries

- Abrasions
- Avulsions
- Contusions
- Crushing
- Cuts

- Impacts
- Lacerations
- Projectiles
- Punctures
- Thermal

Abrasions
(Scrapes)

- Occur when the skin is rubbed away by friction against a rough surface.
- Treatment involved covering with herbal poultices or animal fat.
- Objective was to soothe pain and improve healing.
- Opium preparations for pain were available.

Opium

- Has been known for millennia to relieve pain and for surgical analgesia.
- The 1st authentic reference to the milky juice of the poppy is by Theophrastus at the beginning of the 3rd century BC.
- Arabic physicians extensively used opium and about 1000 AD, Avicenna (Ibn Senna) used it in diarrhea and diseases of the eye.

Opium

- Neanderthals utilized the benefits of the poppy over 30K years ago.
- Scientists don't know exactly when opium came to be, but what they know is that people have been seeking its euphoria and pain killing effects for centuries.
- Called the "joy plant," its use quickly spread throughout Mesopotamia, and was enjoyed by the Assyrians and Egyptians.
- Even the pharaohs partook and opium smoking equipment has been found buried with them in the pyramids.

Opium in History

- In the 1st century, the opium poppy and opium were known by Dioscorides, Pliny, Celsus, and Galen.
- Celsus suggests the use of opium before surgery
- Dioscorides recommended patients should take mandrake (contains *scopolamine* and *atropine*) mixed with wine, before limb amputation.
- Alkaloids like cocaine and scopolamine have strong psychoactive effects, and can be anticholinergics or stimulants.

Opium

- Opioids produce euphoria, pain relief, and sedation in humans and have been used for centuries (5K years).
- Its earliest use was primarily linked to religion and mysticism.
- Primitive understanding of pain had deep roots in the spiritual realm, and ingesting or inhaling opium produced a seemingly transcendent euphoria in the user.
- Egyptian Ebers Papyrus, describes medical uses, such as calming crying children and performing euthanasia.

Opium

- Though opium was being used recreationally, its medicinal uses were not overlooked.
- Both the ancient Greeks and Romans used it as a pain reliever and to induce sleep.
- Ancient physicians thought opium prevented poisoning, and prescribed it for a huge range of ailments including vertigo, asthma, colic, fever, jaundice, leprosy, melancholy, and more.

Pain Relief

- Polypharmacy, including a mixture of nonsensical medications were often used.
- Fortunately for both patients and physicians many of the preparations contained opium.
- A famous and expensive panacea was *Theriac,* containing up to 60 drugs including opium

Theriac

- Ancient preparation originally used as a cure for the bites of serpents, mad dogs and wild beasts, it later became an antidote to all known poisons, and a panacea for all diseases.
- The 1st formula was created by Mithridates VI, King of Pontus, who mixed 60 ingredients and called it *Antidotum Mithridatium*.
- In the 1st century AD, Nero's physician, Andromachus, improved the formula, added flesh of vipers & increased the proportion of opium.
- Became known as *Theriac* of Andromachus, and contained 64 ingredients including minerals, herbs, roots, leaves, poisons, animal flesh and blood, all combined with honey to form an *electuarium*.

Types of Injuries

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Avulsions

- Occur when an entire structure or part of it is forcibly pulled away, such as the loss of a tooth, an ear, part of nose, scalp, or finger.
- Treatment would involve staunching of any bleeding by pressure, tourniquet or cauterization.
- Herbal poultices for healing and pain control.
- Bandaging to protect tissues.

Finger Avulsion

"Degloving"

Contusions

- Non-penetrating injury, caused by hard objects with a blunt surface, producing damage to the area where the force has been applied.
- Occur at the muscular level and can present as sharp pain, bruising, swelling, and slight edema.
- This is a type of closed lesion, so the skin remains intact throughout the process (there is no cut or epidermal discontinuity).

Contusions

- Result of a forceful trauma that injures an internal structure without breaking the skin.
- Blunt blows to the chest, abdomen, or head can cause contusion injury to internal organs.
- Treatment would involve relieving the internal pressure of the injured organ, by trephining or other drainage.

Trepanation
(Trephining)

- Surgical intervention in which a hole is *drilled or scraped* into the human skull.
- The perforation of the cranium exposes the *dura mater* and releases pressured blood buildup from an injury.
- Evidence of trepanation has been found in prehistoric human remains from Neolithic times onward.
- The trepanned bone was kept by the prehistoric people and worn as a charm to keep evil spirits away.

Trepanation
(Trephining)

Evidence of cranial trepanation found in Peru and Australia:

- To treat battle injuries.
- To Evacuate evil spirits.
- Treat seizures, severe headaches.

Healed bone suggests survival.

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Trepanation
(Trephining)

- Trepanation was primitive emergency surgery after head wounds:
  - To remove bits of bone from a fractured skull
  - To clean out the blood that pools under the skull after a blow to the head with clubs or spears.

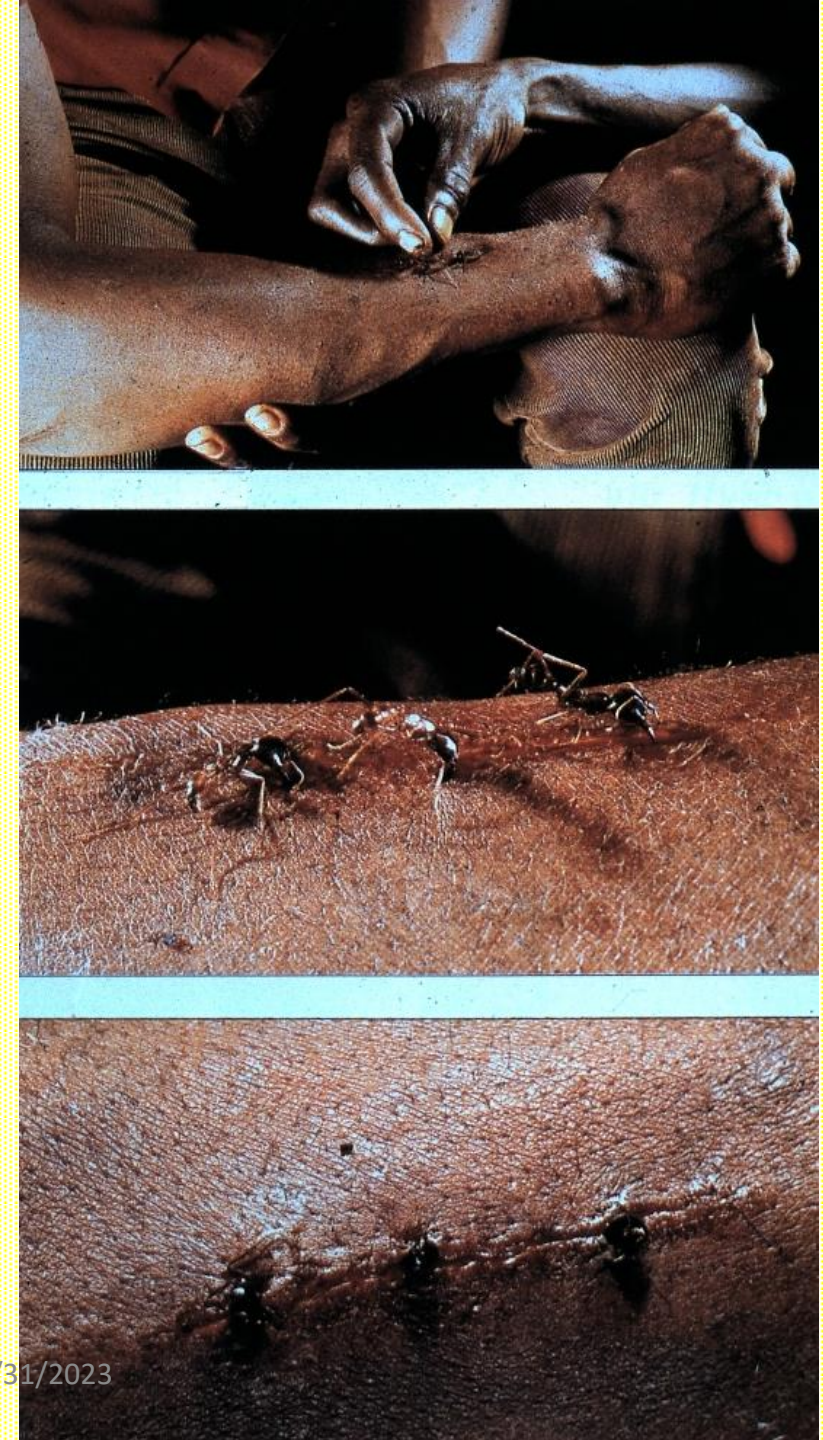
- Trepanations appear to have been most common in areas where weapons were used that could produce skull fractures.

Crush Injuries

- Occur when a heavy object falls onto a person, splitting the skin and shattering or tearing underlying structures, or by being run over by a chariot.
- Treatment would include pain relief, comfort measures, survival was almost impossible.
- Offerings to the gods would be appropriate.

Cuts

- Slicing wounds made with a sharp instrument, leaving even edges, it may be minimal or significant.
- Treatment would involve stopping bleeding, herbal poultices and possible edge approximation.
- Suture needles could be sharp sticks, animal bones, thorns.
- Thread could be animal tendon, cat gut, fiber from hemp or other fibrous plant.



Use of fire ants to “suture” wounds.

Impacts

- Wounds produced by collision between a moving and a static object.
- Damage is caused by the deceleration of the moving element upon hitting the static object.
- The soldier's body can be either the static or the moving element in the impact.

Lacerations
(Tears)

- Separating wounds with jagged edges.
- Produced by a tremendous force against the body from any blunt external source.
- Tears and splits affect skin and subcutaneous tissues.

Projectiles

- Projectile wounds are caused by objects that are launched by an external force.

- Penetration and damage depend on:
  - Propelling force
  - Distance
  - Shape of projectile
  - Protection of the recipient

- Treatment is extraction of object and healing wound.

Punctures

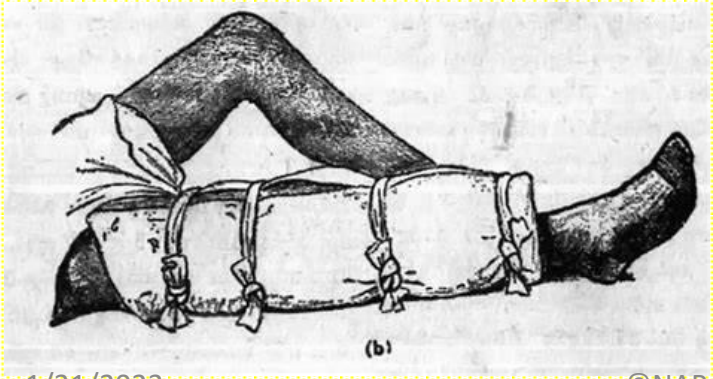
- Penetrating injuries caused by a pointed object.
- They are common, particularly to the plantar surface of the foot and other areas of the distal extremities.
- Caused by projectiles or by stepping on sharp objects placed in path by the enemy.

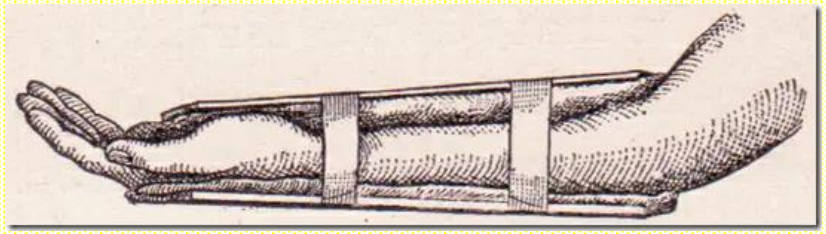
Thermal injuries

- The use of flame and/or hot liquids in war goes back to the dawn of history.
- Burns have been known for at least 5K years.
- Face burn injuries are among the most devastating injuries known.

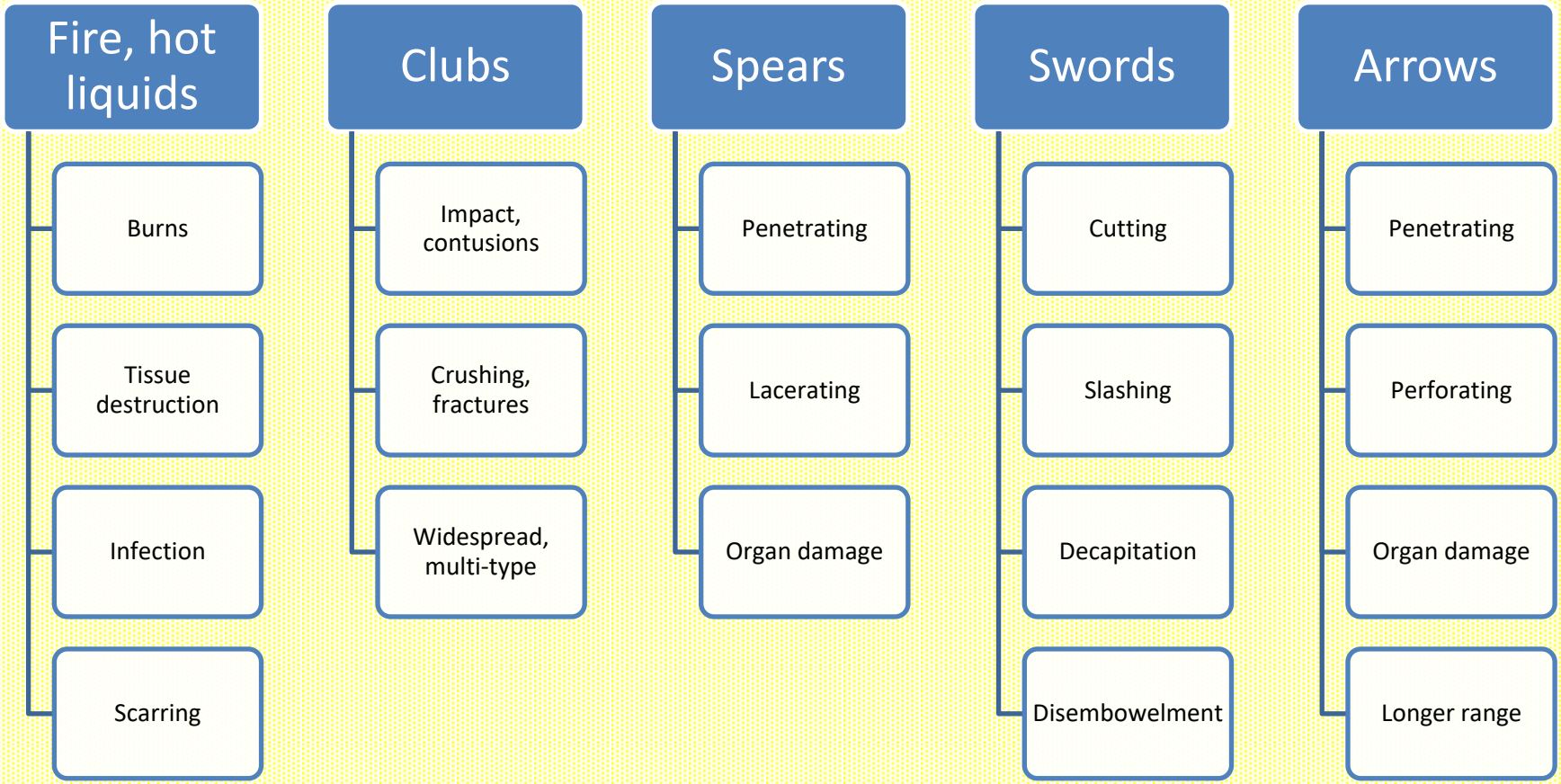
Fractures

- Closed fractures reduced manually and then splinted:
  - Wooden splints
  - Mud ”casts”
- Open (compound) fractures usually got severely infected, and could lead to death.





Wounds from Primitive Warfare



Injury Progression

- Crushing, macerating, fracturing
- Crushing, bone fracturing, penetrating
- Penetrating, internal organ lesions
- Profound penetrating, multiple layers
- Distant, deep penetrating wounds highly accurate, targeted

Questions? (2)

- Clubs
- Axes
- Slings
- Bow and Arrows
- Crossbows
- Blowguns
- Animals

WEAPONS

Weapon Progression 1

- Stones, clubs, fire
- Slings
- Sharpened stones, sharpened sticks
- Throwable spears, **atlatls**
- Bows and arrows
  - Sharpened and hardened tips
  - Stone arrowheads
  - Metals

Sticks, Stones and Bones

Axes

Atlatl

- The name comes from the Nahuatl language, and means "spear thrower".
- It acts as a lever and an extension of the throwing arm and can throw spears 3 to 8 feet in length at speeds in excess of **60** mph and distances of **20** to **300** yards.
- The Clovis peoples (Native American Paleo-Indians) used the Atlatl 13K years ago as shown by stone spear point fractures unique to high-velocity atlatl use.

Atlatl

- Used at least 17K years ago during Europe's Upper Paleolithic era, and have been found in Australia, Asia, North and South America.
- Likely brought to the Americas via the Bering land bridge over 12K years ago by hunters pursuing woolly mammoths.
- The Aztecs used atlatls as combat tools against the conquering Spanish forces of Hernán Cortés in 1521.

Atlatls & Slings

Atlatl

- The atlatl stays level and the dart stays on target throughout the motion.
- As with baseball, the snap of the wrist at the end imparts much of the velocity, and the longer the atlatl, the longer the distance.
- A properly flung 5 ft. spear equipped with a 1 ft. atlatl goes at about 60 mph.
- The maximum speed of an an experienced atlatl user is about 78 mph.

Bow and Arrows

- In South Africa, arrowheads have been found, dating from approximately 72K – 60K years ago.
- The earliest probable arrowheads found outside of Africa were discovered in Sri Lanka and were dated to 48K years ago.
- In Nataruk, Kenya, obsidian blades found in a skull and within the thoracic cavity suggest the use of stone-tipped arrows about 10K years ago.

Bow and Arrows

- The longbow was England's principal weapon of war from the times of William the Conqueror until the end of the Middle Ages.

- Organized warfare with bows ended in the early to mid-17th century in Western Europe, but it persisted into the 19th century in Eastern cultures.

- Genghis Khan and his Mongol hordes conquered much of the Eurasian steppe using short bows.

Bow and Arrows

- The bow has been a specialized weapon that requires considerable training, physical strength, and expertise.
- Many cultures regarded archers as a superior, separate class of warriors, despite usually being drawn from the common class.
- Their archery skills were strengthened and trained from early childhood.

Crossbows

- The crossbow was the 1st simple, cheap weapon that could be operated by large numbers of untrained conscript soldiers.
- Any military body could field a force of crossbowmen with little expense beyond the cost of the weapons.
- The earliest known crossbows were invented in the first millennium BC, with ancient China and Greece, developing the weapon independently of each other.

Chinese Repeating Crossbow

Crossbows

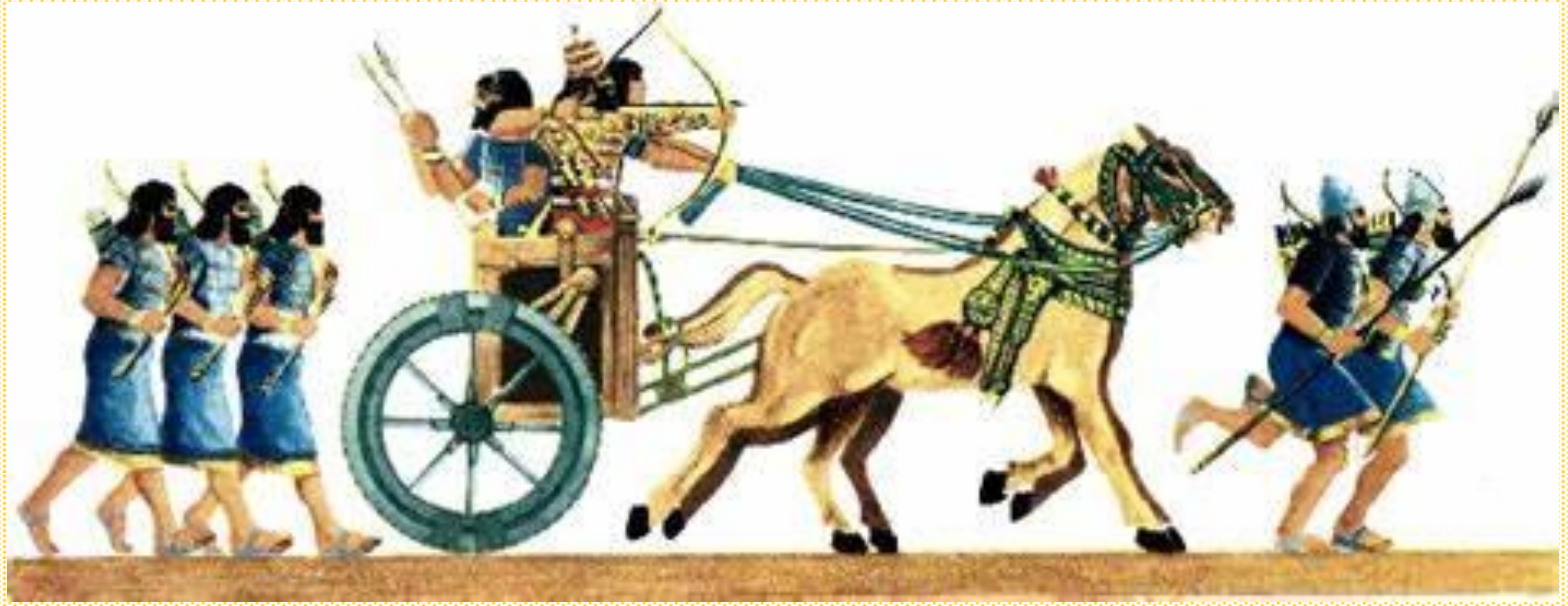
- A crossbow bolt could penetrate armor, enter a chest and go out the other side.
- The Catholic Church tried repeatedly to ban crossbows because of their “cruelty and lethality”.
- The 2nd Lateran Council in 1139 decreed that the device was unfit for use by Christians, and that those who used the crossbow against anyone other than infidels (Muslims and heretics) would be placed under penalty of an anathema.

Crossbows

- The Montagnards of Vietnam's Central Highlands were known to have used crossbows, as both a tool for hunting, and as a weapon of war.
- Montagnard fighters armed with crossbows proved a highly valuable asset to the US Special Forces operating in Vietnam.
- The Green Berets integrated Montagnard crossbowmen into their strike teams against the Viet Cong.

Blowguns

- Blowguns depend on human's expelled breath.
- Range depends on blower and length of blowgun.
- Used with poisoned darts, mainly for hunting.
- Usefulness for war is limited if enemy has any sort of armor.



CHARIOT WARFARE

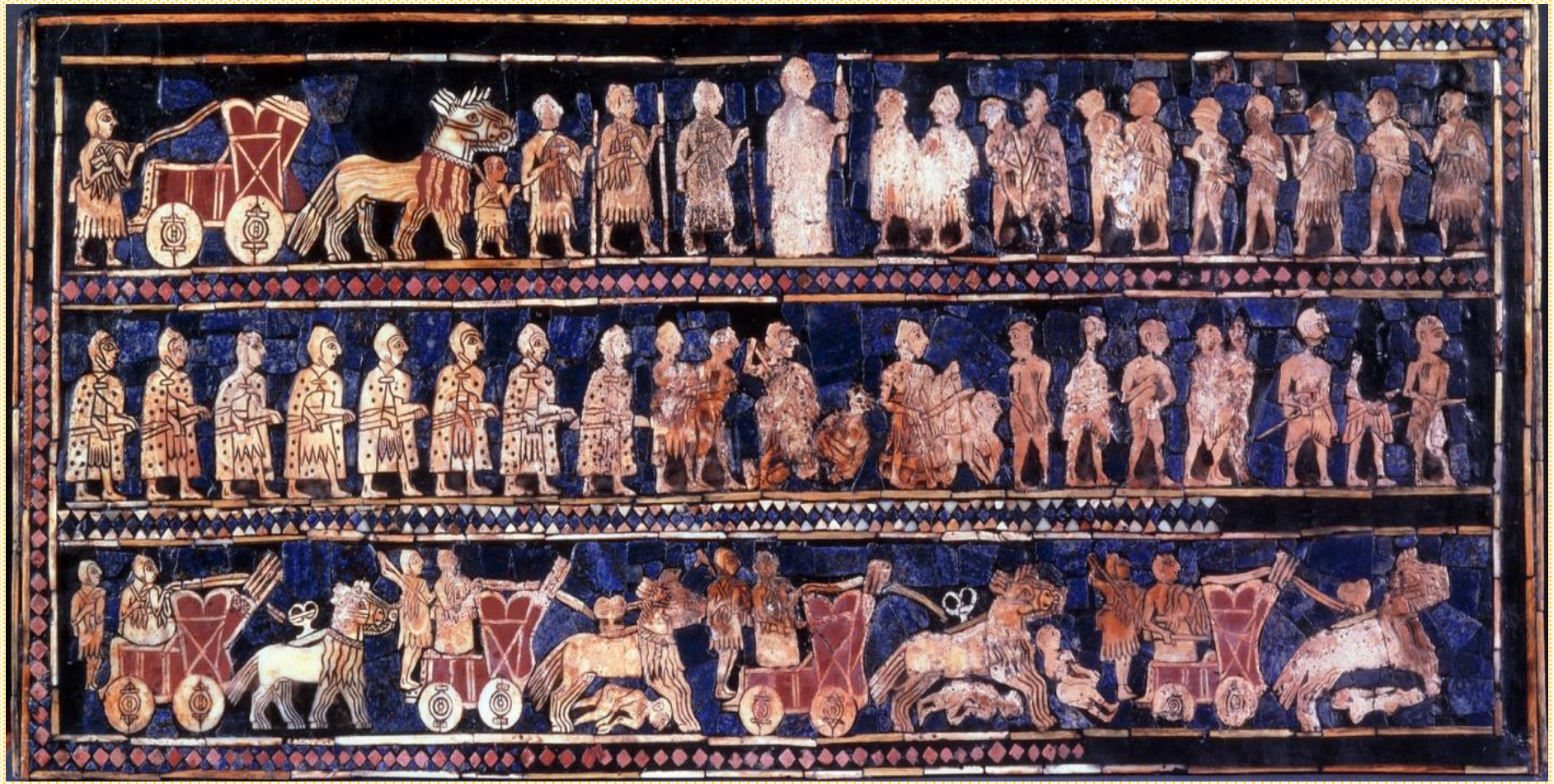
Egyptian Chariot Warfare

- Ramses II located infighting at the Battle of Kadesh.
- There are two archers riding in the chariot, one of them having the reins tied around his body to free his hands.
- Archers in a chariot could use strong infantry bows, but while moving, the shaking lessened the ability to aim at specific targets

Roman Chariot Warfare

- There was really no such thing as a Roman war chariot.
- Chariots in Rome were used for racing and in parades, not in warfare, or daily transportation.
- Wars were not fought on roads or flat racetrack surfaces, but on natural terrain, where chariots were not suitable, thus, there was no official specification for Imperial Roman war chariots.

Chariot Warfare in Ur (~2500 BC)



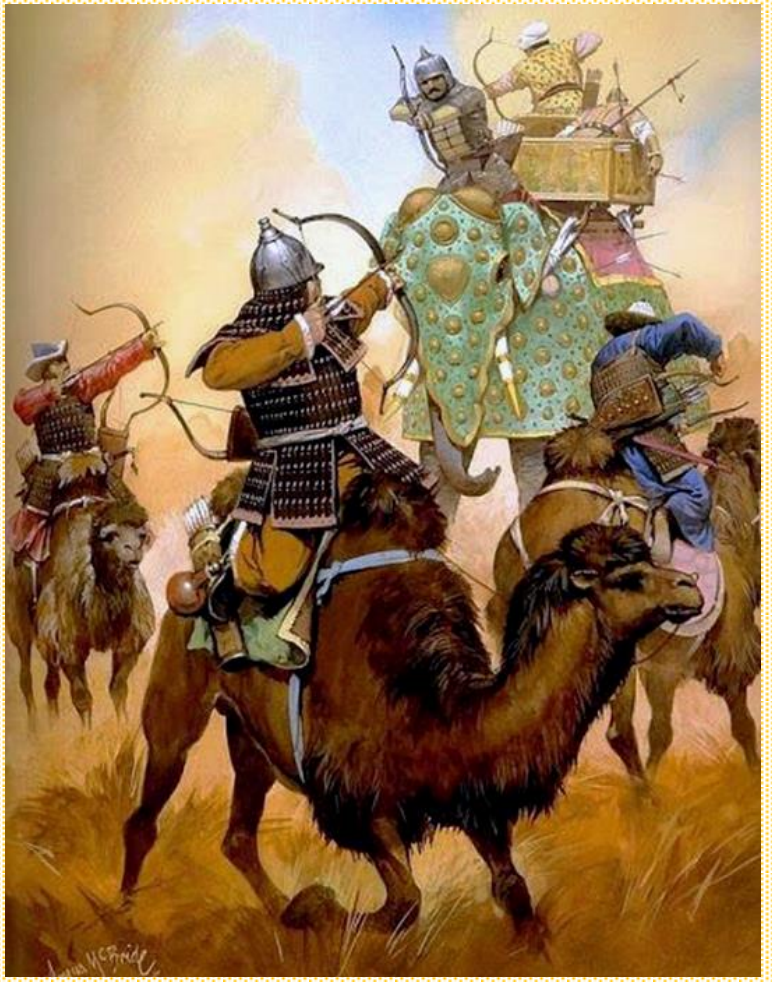
Seleucid War Chariot (~185BC)

Persian War Chariot vs The Greek Phalanxe

- The Greeks used the chariot for auspicious occasions but rarely used the chariot to great effect in battle.
- The Greeks were at the forefront of weaponry but understood that rugged and rocky terrain was not good for chariot warfare.

Other Animals in Warfare

The camels of the Mongols against the Elephants of Tamerlane (Timur).



Chariot Warfare Wounds

- Chariot warfare was not useful for accuracy because of the rough unbalanced ride.
- Wounds were mainly caused by the chariot itself, more than by the bowmen and spears.
- In many battles, warriors were run over by the horses or the wheels.
- Care of those injured was an almost physical and medical impossibility.

Final Questions?

Next Week

- Session 1: Ancient history, Rome, Greece.
- Session 2: Middle Ages, weapons & injuries.
- Session 3: US Revolutionary & Civil Wars.
- Session 4: World War I.
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Thank You